

THE MENTOR

"A Wise and Faithful Guide and Friend"

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No. 15

THE STORY OF PANAMA

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THE CANAL FROM BALBOA TO MIRAFLORES

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ABANDONED FRENCH EQUIPMENT

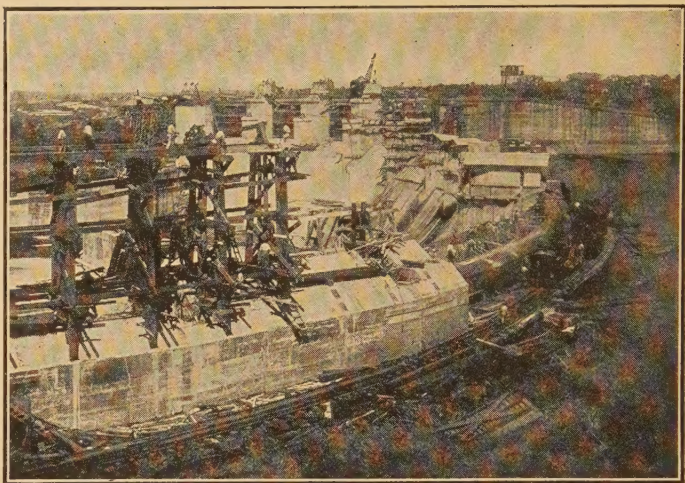
By *STEPHEN BONSAI*

Author of "The American Mediterranean."

PUT in a few words, the story of Panama is simply an ancient fable that is about to become a matter of fact. When Columbus, searching for a new route to the golden East, chanced upon the islands of the West Indies, the Caribs whom he met there told him of a strait a few days' sail ahead through which one might travel past the tropical jungles to the westward into the waters of the great South Sea. Columbus had faith in this story. Indeed, there are people living who believe in it still, and the map of the New World that he inspired, although it was not published until after his death, reveals his belief in the existence of a waterway across the isthmus, permitting direct passage from Europe to India.

In his fourth and last voyage the great discoverer was still in quest of this southwest passage to the East. He was so confident of finding it, and so sure that it would lead him to the rich lands of the Great Khan, that he was careful to carry with him letters of introduction to this important personage. Balboa believed it too, and his death by decapitation

was on this account more generally deplored by navigators than perhaps it would otherwise have been, because it was generally thought that he had located this secret waterway of the isthmus, and that this important secret died with him. I myself, in my limited isthmian experience, have met at least two people who claimed that the mysterious will-o'-the-wisp waterway still exists. One was a San Blas Indian,



SPILLING

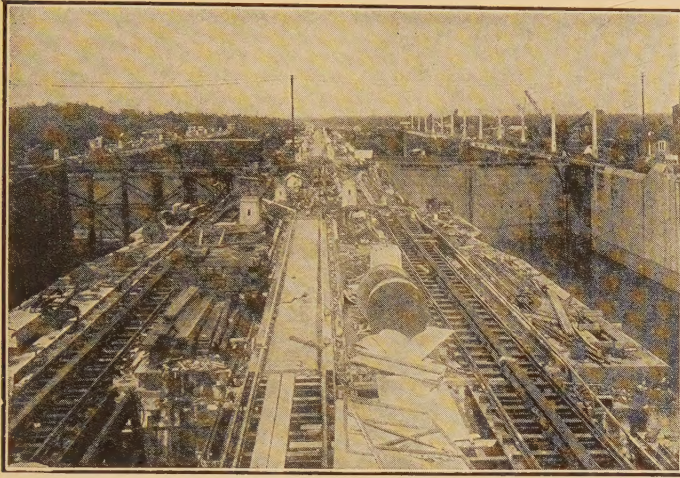
This so-called "spilling" regulates the amount of water in Gatun Lake, and also generates power for the canal.

and the other a halfbreed trader from Cartagena. On different occasions and without possible collusion, and for no other purpose that I could ascertain except a desire to diffuse knowledge, they each stoutly maintained that on several occasions during the rainy season, by ascending the Atrato River, with a portage of less than three hundred yards, they had embarked upon the San Juan River, which flows into the Pacific.

The early navigators, baffled in their search for the waterway, early bethought them of digging the canal that is now nearing completion. The idea took such shape that in 1523 Cortés, the conqueror of Mexico, 250 years before the birth of the nation destined to construct the canal, made a definite proposal to Charles V. of Spain and half of Europe to dig his way across this inconvenient neck of land. His plan fell to the ground, as have so many succeeding ones; but Cortés, the real pioneer, never abandoned the project. In one of his last letters to his cousin, Saavedra Ceron, he urged him to follow up his preliminary surveys, and indicated that in his opinion there were four possible sites for a transisthmian waterway; namely, Darien, Nicaragua, Tehuantepec, and Panama.

Reports followed reports, and surveys followed surveys, only to be filed away in the archives of Seville and Simancas, until Philip II. came to the throne. He had at first been more enthusiastic than his father, Charles V., over the isthmian project; but an unfavorable report on the Nicaragua route made to him by Antonnelli depressed him, and he finally laid the matter before a council of Dominican Friars. They

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GATUN LOCKS

Looking from center wall. The parallel arrangement of the locks may be seen, with the Atlantic entrance in the distance.

across the Isthmus of Panama, along the rough trail from Panama City to the Atlantic or Caribbean ports of Nombre de Dios and Porto Bello, grew up one of the world's richest trade routes. And, even if our canal gets all the business that it is expected to secure, history will be only repeating itself once again. Prosperity has visited Panama before. From 1550 to 1650 were the halcyon days of the isthmian trade route. Through these swampy jungles and along these rocky defiles passed the plunder of the Inca temples in Peru, the silver from the inexhaustible mines of Potosi, the precious stones from the Andes, the pearls from the islands, and the dyewoods from Central America. There was also a considerable traffic in transshipping goods from the spice islands and the Far East, and so in a way Panama had become what Columbus dreamed it would prove to be, the gateway to China and Japan.

Frequently during this period one hundred ships and more from Spain in the course of a year touched at the Atlantic ports, and they did a business that would be considered large even at this day. Spain held her colonial business by one of the closest monopolies that the world has ever known, and no outsiders were to be allowed to share it. On the bluff overhanging and defending the entrance to the Chágres River you can still see the great battlements of San Lorenzo Fort, which notified all shipping but the caravels of Spain that here was no thoroughfare, and that the South Seas belonged to Spain.

We have a quaint picture of what happened in these boom towns that sprang up along the isthmus from the pen of one Thomas Gage, who

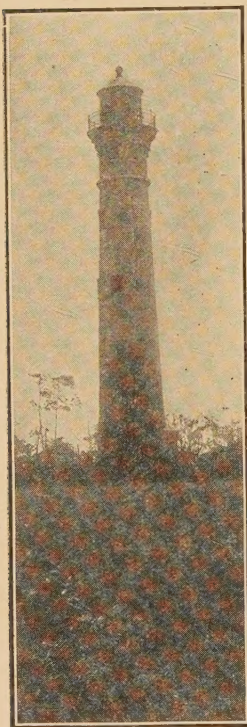
doubtless interpreted the king's mood correctly. He was tired of the whole business, and they rendered a decision against all the proposed canal projects, quoting from the Bible, "What God hath joined together let no man put asunder." So for a generation or two the building of the canal was under the ban of the church.

While the canal projects were discussed and finally dropped,

began life as a Catholic missionary in Guatemala, reformed himself and became a preacher of the word of God in Kent.

"But what I most wondered at," he writes in describing his sojourn in Porto Bello, "were the mules which came hither laden with wedges of silver. In one day I told two hundred mules laden with nothing else, which were unladen in the Publicke Market Place, so that there the heapes of silver wedges lay like heapes of stone in the street, without any fear or suspicion of being lost."

Such rich booty as is here described naturally attracted the pirates and the corsairs of the western ocean. The Bretons and the Englishmen of Devon distinguished themselves by their successful depredations, and gradually the Spaniards were compelled to protect their shipping in a systematic manner. Great merchant fleets were ordered to sail at stated intervals, and they were always accompanied and defended by convoying warships. By royal decree, in 1561, ships were prohibited upon penalty of confiscation from sailing to America alone and unaccompanied. Soon it became the custom and indeed the law to organize two fleets each year. One was bound for the isthmus, touching at Cartagena and Porto Bello, while the other sailed to Vera Cruz, in New Spain (Mexico). The last mentioned fleet, called the *flota* in Spanish story and legend, was commanded by an admiral, and sailed for Mexico in the early summer so as to avoid the hurricane season and the northers of the Gulf. The isthmian fleet, usually called the "*galeones*" (galleons), was always commanded by a general, and sailed from Spain earlier in the year, generally in January or March. If it did not get away from Cadiz or San Lucar until March, it usually wintered in Havana, and returned with the *flota* the following spring.

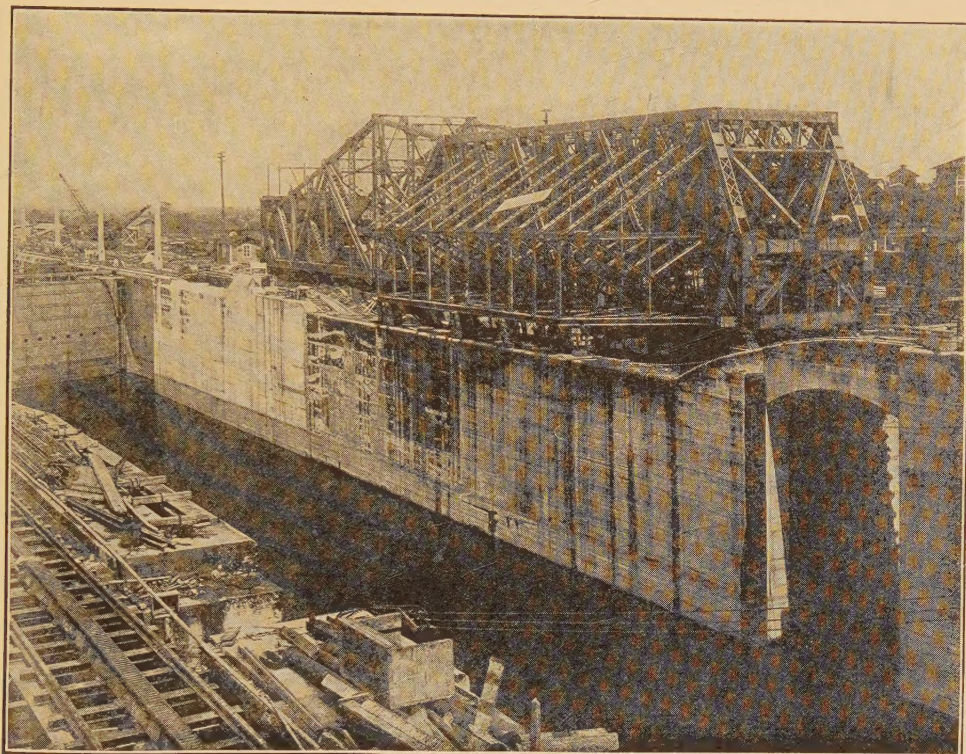


LIGHTHOUSE

Type of lighthouse used along the canal. These lights are arranged one behind the other, and the pilots in following the channel keep the two lights lined up until two more appear, one directly behind the other. This system is known as "range lights."

During the first century of our national manhood many interoceanic canal projects were frequently launched, and there were few sessions of Congress in which the question of ways and means was not discussed. The rush to golden California in '49 and the subsequent years brought the importance of the subject home to our people; but the Civil War and the active construction of transcontinental railways that followed sidetracked anything but academic debates on the subject.

THE STORY OF PANAMA



EMERGENCY DAM, GATUN

This great bridgelike superstructure, in the event of accident to the regular gates, is made to swing across the lock and drop a steel draw, which holds back the water of Gatun Lake from rushing through the lower country beyond.

De Lesseps, builder of the Suez Canal, took up the project in the late '70's, and such was the magic of his name that in a very few days \$88,000,000 worth of stock in his Panama Canal Company was subscribed for by the French peasants, who, intoxicated by the promise of great gains, poured out from their woolen socks the savings of years. In 1888 the French company went into bankruptcy, having expended \$260,000,000 and having excavated only 80,000,000 cubic yards of dirt. The courts formed a new company out of the debris of the old, and enough excavation was done each year to hold the concessions until 1904, when all the canal properties were purchased by the United States for \$40,000,000.

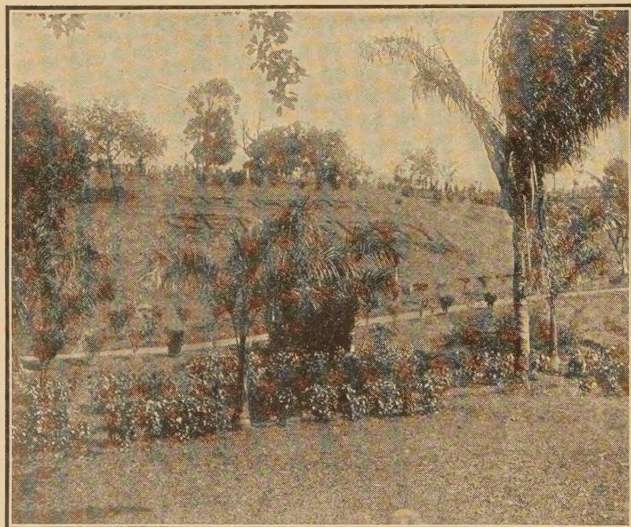
There were in progress at the time several civil wars in Colombia, and the state of law and order on the isthmus itself left much to be desired. Under these circumstances our government decided it would be a wise precaution, and one indispensable to the orderly progress of the gigantic

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work, to secure by purchase a strip of territory across the isthmus, to be converted into a canal zone under United States sovereignty.

Colombia, more than any other country, was to be benefited by the completion of the canal. It would not have been surprising had she been called upon to mortgage her resources that were about to be made accessible to assist in constructing the great waterway. However, nothing of the kind was asked, the United States government simply offering a bonus of \$10,000,000 and a yearly rental of \$250,000 for the canal zone. This arrangement was accepted by the Colombian representatives in Washington, and was on the point of being sanctioned by the Colombian Senate in Bogotá when an opposition developed. The argument that was listened to favorably by a majority of the Senators was much as follows:

Within a short time the concession granted to the French company,



MT. HOPE CEMETERY

Twenty thousand French and five thousand Americans are buried here.

which had been conveyed to us, would expire. Consequently, if the treaty that was then before them for ratification was only postponed for a few months, the \$40,000,000 that we were pouring into the French coffers would have to be paid out in Bogotá to secure a renewal of the concession. This plan was definitely decided upon, and the treaty was deliberately shelved in October, 1903.

Its being a matter of most vital concern to their future, the people of Panama had naturally enough

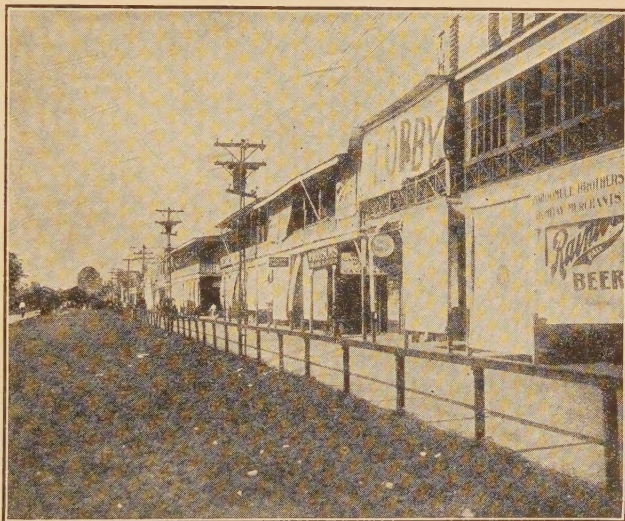
followed with closest attention the course of these negotiations. When they believed that their future, either temporarily or for all time, was about to be sacrificed by the people in Bogotá, and that they were running the risk of compelling the United States to build the waterway across Nicaragua, they rose in rebellion and declared their independence. The United States paid the new republic the sum that had been offered to Colombia, secured the necessary territory and concessions, and began the great work.

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A description of the American canal in simple terms is a very difficult matter. Much to the surprise of most visitors, the Isthmus of Panama runs nearly east and west, and the canal traverses it from Colon on the north to Panama on the south, in a general northwest to southeast direction, with the result that the Pacific terminus of the canal is twenty-two miles east of the Atlantic entrance.

The first section of the canal from Limón Bay on the Atlantic side to Gatun is a sea level waterway for a distance of seven miles. At Gatun a mammoth dam has been constructed, which, impounding the waters of the Chágres River, forms a lake of about 164 square miles in extent. Ships will reach this lake by three locks or steps, which have a combined lift of about eighty-five feet.

This high level of the waterway is maintained—or rather it will have to be maintained if it is to remain navigable—through the great artificial lake and through the cutting of the backbone of the continental divide at Culebra, until Pedro Miguel, on the Pacific side of the isthmus, and about thirty-two miles away from Gatun, is reached. Here the descent or return toward sea level is begun with a single flight of locks, with a lift or drop of thirty feet. The waterway continues on this fifty-five-foot level for several miles, until the double flight of locks at Miraflores is reached. Here the return to sea level is effected, and from here the shipping of the future will pass out into tidewater through tidal gates, which are designed to control the very important fluctuations of the tide in the Pacific, amounting as they do at times to twenty feet. The length of the canal from shoreline to shoreline is about forty miles, and from deep water to deep water, from the Caribbean to the South Sea, it is ten miles longer.



MAIN STREET, COLON

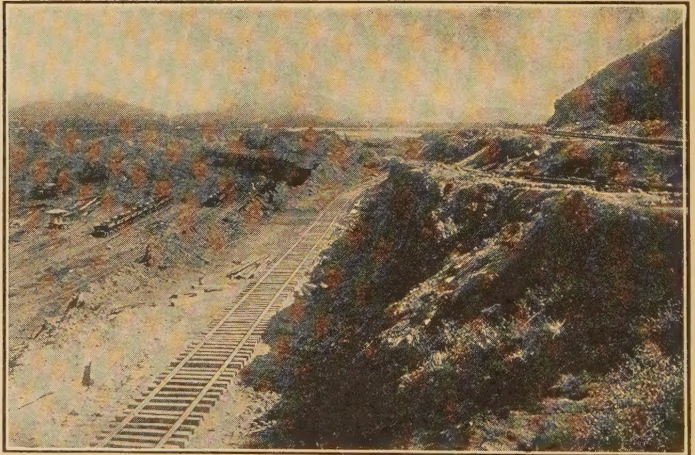
When the United States entered the canal zone in 1905 Colon was a huge lake of mud and a hotbed of disease. It is now clean and healthy, with excellent waterworks and sewer system.

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One by one, in the course of the nine years that this colossal work has been in progress, the many obstacles to its success have been overcome. Each day has presented its problem, and each day with the going down of the sun a triumph of persistent man and of mind over stubborn matter has been chronicled. Other problems may be lurking in the future, but the one vexatious and unsolved question today is the treatment of the slides of dirt and hardened clay in and about the cut through the hills at Culebra. These landslides have already necessitated the excavation of twenty million cubic yards of dirt from the future waterway, and it is estimated that today about 189 acres of land are on the move toward the channel. Some of these landslides have been in progress more or less uninterruptedly since the French began to dig, and the end is as yet by no means in sight.

We know very little about the causation of the slides. By some they are compared to the glaciers of the Alps; by others to the sifting sand of the Sahara. These comparisons are picturesque, but as yet they have not proved helpful. The steam shovel men who work on this firing line of progress say the slides are caused by a "lot of dirt that is such poor, mean stuff it cannot sit up under its own weight." The best opinion seems to be that the slides are caused by lateral pressure from the banks of the cut. And with the view of stopping or at least curtailing the advance of the great earthen glaciers into the canal channel and to help the uneasy earth to find the much-desired angle of repose, many of the adjacent banks have been topped and cut down at great expense, so reducing the lateral pressure. This treatment has met with some, but not with uniform, success, and the prospect of our being compelled absolutely to remove every one of the slides now in sight or yet to appear is of course far from being a cheerful one, either to the engineer or to the taxpayer.

While securing the services of our most famous geologists to study systematically



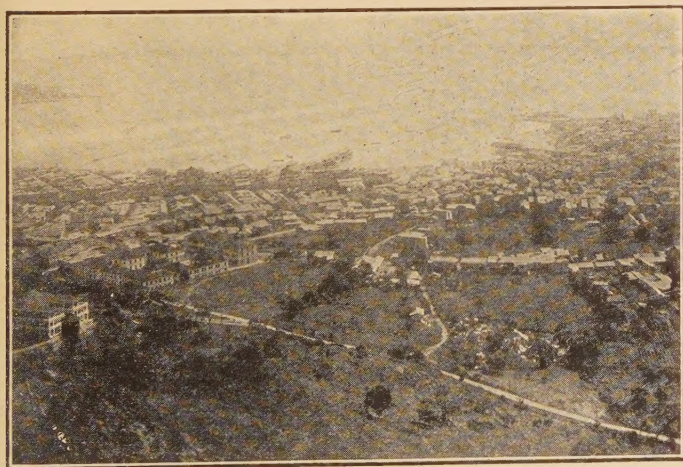
LOOKING TOWARD THE PACIFIC

From Miraflores to the Pacific the canal will be dug at sea level, with a channel bottom of 500 feet.

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the nature of the slides, in the hope that they may hit upon a rational and possible formula by which the slides can be combated, the policy of Colonel Goethals and his fellow commissioners is patience and uninterrupted digging. It is not admitted for a moment that the slides, exasperating and costly as they have proved to be, will in the slightest endanger the ultimate success of the project. Further, it is proposed at the very earliest possible moment, perhaps in a very few weeks, to turn the water that is being impounded in the great lake into the canal channel. It is hoped that the resulting pressure will restrain the slides and hold back the uneasy banks. In any event, it is claimed that the costly work of removing the slides, if it has to be done, can be carried on more economically by the use of sea-going dredges, which can operate under their own steam and while the canal is at least in partial operation.

The recurrence and the extensive development of these landslides in the Culebra region is regarded by most engineers as emphatic confirmation of the wisdom of the choice that was made when the president and Congress accepted the high-level canal project and rejected the sea-level plan. On the other hand, the slides furnish the uneasy basis of some criticism to the effect of why, when the high-level plan was decided upon, the commission did not choose the hundred-foot level, rather than the eighty-five-foot level. The hundred-foot level was selected by the French when for lack of funds and for other reasons they abandoned their original plan of a sea-level canal like that of Suez.

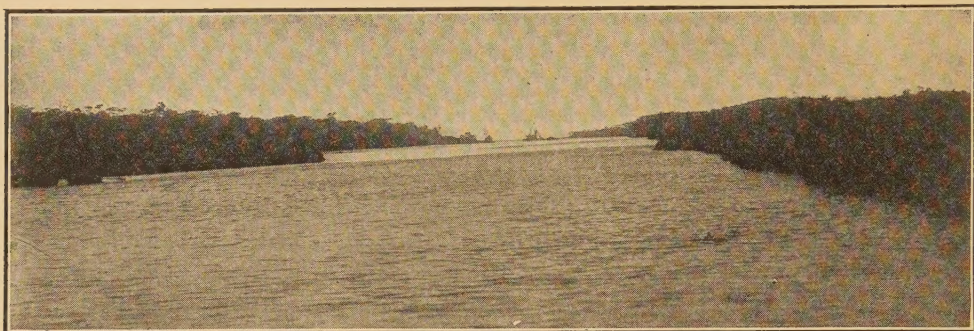


OLD PANAMA

Looking from Ancon Hill toward the old harbor. The Pacific Ocean may be seen in the background.

Of course it is probable that the hundred-foot level would have avoided many costly slides of which we now know and perhaps more that we are to come in conflict with in the immediate future; but there is another side to the picture that is not emphasized even when it is not entirely ignored by these captious critics. Had the hundred-foot level been chosen, the water level in the lake and the

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ENTRANCE TO THE CANAL FROM THE ATLANTIC OCEAN

canal would have had to be raised at least fifteen feet higher than is necessary under the present plan, and of course this is an important factor in the situation, which it would not have been wise for those responsible for the canal construction to ignore. While available statistics would seem to prove that the floods of the Chágres River will furnish all the water necessary for the maintenance of this eighty-five-foot level, they might not have furnished the immensely greater volume of water needed for the higher level. So it would seem to be a case where it is six of one and half a dozen of the other. What we might have saved on extra and unforeseen digging we should have in all probability been compelled to expend in impounding an additional water supply.

One of the many fantastic suggestions as to the adornment of the great waterway has been that every milestone that will mark the passage of the canal from the Atlantic to the Pacific should be surmounted by a bust of one of those great men who appreciated the importance of an interoceanic waterway, and worked for its realization. Among those who were preëminent are Alexander Humboldt, who foresaw the part that Panama would play in the world's history, preached the necessity of the canal, and visualized the west coast of South America, once the canal was completed, as no other man of his day had. And then Nelson, the hero of Trafalgar, should not be forgotten; for it was he who perhaps made the first serious studies of the Nicaragua route. And no man, not even excepting our own Henry Clay, was such an enthusiastic canal builder as was Louis Napoleon.

Napoleon became enamoured of the scheme when in prison, as a result of his first unsuccessful attempt to achieve power. He was originally a Nicaragua advocate, and in 1846, when he escaped from prison, he flooded the press of the world with articles setting forth his views on the proposed waterway.

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Who will have the temerity to oppose the prophetic conclusions of Colonel Gorgas, the chief medical officer of the zone and leading authority on sanitation in the world.

"We believe," he said recently to the medical congress, "that the sanitary work on the isthmus will demonstrate that the white man can live and work in any part of the tropics and yet maintain good health, and we believe that the settling of the tropics by the Caucasians will date from the completion of the Panama Canal."

So we have the very highest authority for the belief that the conquest of the isthmus will not merely change the channels of the world's commerce, or make accessible lands that have long been sidetracked or ports that have long been deserted. From the successful sanitation of this plague spot, famous for its ravages throughout five centuries, man will doubtless enter upon a campaign for the fuller utilization of the riches of the tropics.

Though it may well be considered as the eighth wonder of the world, and up to the present by far man's greatest work of art, the engineering achievement at Panama will soon be filed away as a commonplace page in the history of yesterday, while the lessons it teaches and the indirect results of the conquest of the isthmus will continue to exert an influence upon the destinies of the world as long as our civilization survives.



CULEBRA CUT

Looking from Contractors Hill toward the Atlantic Ocean. The cut is still 18 to 20 feet above channel bottom

SUPPLEMENTARY READING



The American Mediterranean *Stephen Bonsal*

Central America and Its
Problems *Frederick Palmer, F. R. G. S*

Panama *Albert Edwards*

American Supremacy *George W. Crichfield*

Tropical America *Alleyne Ireland*

Four Centuries of the Panama Canal *W. F. Johnson*

The Panama Canal and Its Makers *Vaughan Cornish*



QUESTIONS ANSWERED

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subject can obtain it by writing to

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381 Fourth Avenue, New York City



IMAGINE if you can a great tub, one thousand feet long, more than one hundred feet broad, and eighty-five feet deep. Imagine that this huge tub has in its side immense gates as high as a seven-story building and half a city block wide. Then you can form some idea of one of the most impressive features

of the Panama Canal—the Gatun Locks.

And the parts of the Gatun Locks that most strongly kindle the imagination are the great steel gates. These gates have had to be so strongly constructed that they will be able safely to withstand the terrific pressure of the water in the lock. Yet these gates, huge as they are, swing open as smoothly as a parlor door. Each gate is in fact a pair of gates; for they open in the center and swing back against the sides of the lock. And they are operated by only one man, who sits in a tower located on the center wall of the locks. To move these mighty masses of steel he has but to touch a single lever. It is inconceivable, upon seeing the size of these great barriers, to imagine that such a mass of steel can possibly be swung upon hinges. Yet they are, and seemingly with no effort at all, opening wide or closing tight in two minutes' time.

When these gates are finished and ready for use only a small portion of their wonderful construction is visible. Appearing as a solid steel wall, they are in reality a honeycomb of steel squares bolted and riveted together, upon which the steel sheets are fastened.

To erect this framework of steel and then cover it with the plates, required many months. All day long hundreds of men were busily engaged driving the millions of rivets required to hold the plates securely to the framework. Holes had to be drilled through two thicknesses of steel plates as they overlapped each other before the bolts, heated to whiteness, were driven home and headed by pneumatic riveting machines.

Although the gates weigh hundreds of tons, they are so perfectly swung and operated that when closed they are watertight. To make sure that the gates will be perfectly watertight, the edges have been ground by hand so that they fit along the entire edge.

There are ninety-two of these gates, or forty-six pairs, half of them at Gatun, the other half at Pedro Miguel and Miraflores. The construction and operation of them all are identically the same. These gates were made in the United States, and were shipped to the canal in sections and parts of sections. The greater task of erection was left to an army of canal workers, whose ability has been proved by their achievements on the isthmus since their arrival in 1905.



THE STORY OF PANAMA *At Work in Culebra Cut*

TWO

LOOK out for the dirt train!" This is heard all over the isthmus. No matter what else may be on the rails, it must "sidetrack" to let the dirt trains by. If a passenger train of the Panama Railroad stops between stations, the reason given for the delay is usually, "We have taken a siding to let the dirt train by."

Whether these important trains are moving over the many miles of tracks built especially to enable them to reach the various dumping grounds, or running over the main line of the Panama Railroad, it is all the same. Nothing can stop them, not even Colonel Goethals' private car. They have absolute right of way. All through the hot day, until the tropical sun has sunk behind the horizon of silhouetted palm and cocoanut trees, the dirt trains are constantly rushing along from the great excavation to the dumping grounds. They are not even still when being loaded; for as the great steam shovels pile on the dirt the train slowly moves along, in order that the next dipper filled with earth can be dumped upon an empty part of the car, and when the last car is loaded, off to the dump it goes, at a speed that would do credit to an American train.

Upon reaching its destination, no time is lost in unloading. A great, fast plowlike affair scrapes the dirt off the entire train of twenty cars in less than ten minutes and back for another load it goes.

There are two types of trains used on the canal. One is composed of steel cars automatically dumped by compressed air from the engine, while the other style is composed of ordinary flat cars. Un-

loading is done by this plowlike arrangement, drawn along the length of the train by a cable.

All through the years of yellow fever epidemics and the annual floods during the rainy season the dirt trains have never stopped. The men who operate them seem to be inspired by the greatness of the undertaking. Nothing short of death can stop them in their fierce efforts to keep the dirt moving.

Hundreds of these trains leave Culebra Cut every day, and a great many more receive their loads from various other excavations along the canal. Yet so perfect is the system of operating that an accident rarely occurs. In addition to the block system in use on the Panama Railroad and some sections of the improvised roads, flagmen are placed at all crossovers and sidetracks. One colored flag controls the loaded trains, and one of another color the empties.

The greatest credit must be given the operators of these trains; for they have been on the job day in and day out, through periods of yellow fever, malaria, and other tropical diseases, to say nothing of the many times they have kept the trains moving when floods during the rainy season had completely covered the tracks.



THE STORY OF PANAMA

The Canal from Balboa to Miraflores

THREE

CENTURIES ago, when Balboa, crossing the Isthmus of Panama, stood upon the crest of the mountains forming the great continental divide and viewed for the first time the distant waters of the Pacific, he never imagined that some day man would bring the waters of this great ocean across the intervening miles to the foot of the

mountains upon which he stood. Yet this is what has been done by the Americans since 1905. While the work of constructing the immense locks was going on in the central part of the isthmus, a huge force of laborers, with steam shovels, dredges, and other modern machinery, was digging a channel from Balboa, the Pacific entrance to the canal, named after the great discoverer, to the town of Miraflores, where the first locks are located.

A great problem confronted the engineers in the excavating of this six miles of sea level canal; for the Pacific Ocean has a tide of twenty-one feet. This meant that in addition to the digging of a channel deep enough to allow the largest ship to pass through, a retaining bank had to be constructed to prevent the flooding of the surrounding territory at high tide.

Standing upon the top of Ancon Hill, a peak just to the south of the canal, an excellent view is obtained of the work. From this point the canal can be seen from where it emerges from behind Soca Hill, a high knoll about a mile inland from the Pacific entrance, to within a short distance of Miraflores. The entire country for several miles to the south of the canal along this stretch is comparatively low and flat. Immense fills are necessary to protect it from tidal overflow. Thousands of trainloads of earth hauled from the excavations at other places on the

canal have been used, in addition to what was taken from the cut along this section to build this embankment. While called a retaining bank, it is in reality a new surface, raised to a height of from twenty feet to a hundred feet over several square miles of territory.

The work on this sea level stretch of canal was made even more difficult by the constant floods, caused by the torrents of rainfall during the wet season, from April to December. The same spirit that made possible Culebra Cut and the great locks has prevailed on this work. The men pushing ahead overcame the many difficulties, till at the present time it is practically completed.

It is hard to imagine that this vast territory, now healthy, dry, and clean of dense tropical trees and vegetation, was a few years ago an almost impenetrable jungle, the lurking place of yellow fever and malaria. Many thousand French and American laborers fell victims to fever when working on this section, and were buried in a cemetery so close to where the canal now runs that the white stones marking the graves can be plainly seen from the canal. These gravestones stand as a constant reminder of the tremendous human sacrifice made, in order that the world might some day benefit by a waterway across the Isthmus of Panama





It can be truthfully said that to the giant shovel is due the Panama Canal. Were it not for the modern American steam shovels the big ditch would undoubtedly have remained as it was when left by Ferdinand de Lesseps, ruined and heartbroken. De Lesseps abandoned the isthmus, leaving thousands of workmen who

had fallen victims to yellow fever buried near the scene of his hopeless effort to build this great canal.

When the United States began work on the isthmus in 1905 nearly all the French equipment had to be discarded. It was entirely inadequate to accomplish the task undertaken. What the French, guided by De Lesseps, had hoped to accomplish with hand shovels and tiny dirt cars, together with a few mechanical dirt-digging machines of an impractical character, the United States planned to do by modern machinery. While part of the American canal force was installing a sanitary system and waging war on the yellow fever mosquitos, many others were equally as busily engaged getting the great steam shovels from the dock at Colon to Culebra Cut.

Each one of the gigantic American shovels can do more work in one day than one thousand French laborers accomplished in the same time. Each is operated by two men, sheltered from the intense tropical sun by a cabin on the shovel. The taking out of the dirt from the cut goes on from early morning to the close of day. The shovels with their great steel hands, almost human in their movements, reach down, pick up five

cubic yards of earth and rock, and load it on the dirt trains. Immune against yellow fever and the fiendish heat of the midday sun, totally disregardful of the floods during the rainy season, the shovels work month in and month out. Never do they fail to remove the many thousand cubic yards of material expected of them.

The men operating these shovels form a fond attachment for them. And it seems as if the shovels felt this regard, so quickly and accurately do they respond to the guiding hand of the man at the lever. It is the ambition of each shovelman to take out the greatest number of cubic yards of material from the cut during the day. So great is the rivalry among the shovels that they remove a great deal more earth during the day than it was originally expected the shovel was capable of doing.

It is hardly conceivable, but nevertheless true, that this spirit of rivalry and pride felt by the men for their shovels has pushed the capacity up to such an extent that one shovel has a record of digging and loading 4,823 cubic yards of earth and rock in one day. This, if loaded on wagons, would have required 3,000 two-horse teams to carry off.



THE STORY OF PANAMA *Abandoned French Equipment*

FIVE

NOT far from the Atlantic entrance to the Panama Canal is a huge pile of old French dirt cars, abandoned by the Americans as unfit for the great undertaking started by them in 1905. Piled high, one upon the other, this mass of rusty and misshapen iron stands as a monument to the heroic but hopeless effort of the French,

headed by the impractical Ferdinand de Lesseps, to achieve fame by uniting the Atlantic and Pacific with a sea level canal across the Isthmus of Panama.

It was the dream of Ferdinand de Lesseps, after his triumphant completion of the Suez Canal, to undertake the construction of a canal across Panama. Financed by the French government, together with large private subscriptions, De Lesseps, the dreamer, began work on the isthmus in 1879. Shipload after shipload of equipment was sent to Panama, while thousands of men left France to take up the task of digging a great channel across the isthmus.

De Lesseps' plan was a sea level canal with no locks or dams. The tiny dirt cars of the French held scarcely a cubic yard of material. They were expected to remove all the dirt taken from the canal, which, according to their plan, would demand the entire channel to be dug sixty feet lower than the American plan required. Had all the French dirt cars on the isthmus been in daily use constantly since 1880 they could not have removed the earth required to make a channel deep enough to unite the oceans in a hundred years.

Utterly hopeless as the undertaking was, thousands of the French laborers, led

by the impractical and impulsive De Lesseps, toiled for years under conditions so frightful that the human sacrifice was unparalleled in the history of engineering. Yellow fever and other tropical diseases constantly prevalent over the entire isthmus, claimed a human toll so great that nothing short of heroism could have prompted the continuance of the work. Day after day the remaining workers would have first to bury those who had fallen victim to the fever before resuming their work on the canal.

How long human endurance would have held out against the frightful death rate will never be known; for salvation came at last to the few who had not fallen victims to one or another of the tropical fevers. De Lesseps' company went bankrupt.

Well might these cars, so closely associated with the tragic deaths of the French canal workers, have been used as coffins. As the sun sets behind the huge pile of old equipment it casts its shadow over the graves of twenty-five thousand men, sacrificed in the impractical undertaking. What irony, that this great pile of abandoned cars, overgrown with tropical vegetation, should mark the resting place of those whose last days were spent in a vain attempt to prevent the cars from being abandoned as junk.



CULEBRA CUT might well be termed "The Grand Canyon of the Canal"; for so stupendous will it appear when completed and the water let in that the most vivid imagination can scarcely imagine it the work of man. For nearly a century it has been the dream of nations that some day man would succeed in tearing asunder

the mountains forming the continental divide, allowing the waters of the Atlantic to flow across the isthmus and join the placid Pacific. The French, assured by De Lesseps of the possibility of uniting the two oceans by means of a canal across the Isthmus of Panama, began work in 1879. For a number of months his brave followers strove to lower the great mountains; but the result was a mere scratch upon the surface, compared with the immense canyon the Americans have excavated. After thousands of French laborers and many of the most prominent engineers had fallen victims of the deadly yellow fever, the task was abandoned.

In 1905 the United States Government bought from the French their right in Panama and all their old machinery and equipment. The digging of Culebra Cut began at once on a scale so tremendous that it attracted the attention of the entire world. For three years following the American invasion the task of digging a great canal through the huge mountains and impenetrable jungles was enough to discourage any corps of engineers and laborers.

To add to the seeming impossibility of the undertaking, there was a constant battle against yellow fever during the first three years. The government began a "clean-up campaign" and a war on mosquitos soon after the canal work began, and the Americans worked fearlessly through all this period of suffering and

death. Each day thousands of cubic yards of earth and rock were removed from the cut.

Abandoning the pitifully inadequate outfit left by the French, our country replaced it with modern steam shovels and hundreds of dirt cars hauled by American locomotives. The great hills shook and the jungles echoed the roar from the explosion of thousands of pounds of dynamite, used to tear away the face of the mountains to allow the shovels to nose their way through on their slow but sure journey to the Pacific. Since 1905 an army of workers, guided by the ingenuity of American engineers, has blown apart, shoveled up, and carried away 88,550,000 cubic yards of earth from Culebra Cut. Today the work is ninety per cent. completed.

The best view of the cut is to be had from the top of the bank opposite the town of Culebra. More than half a mile across is the opposite bank. Hundreds of feet below are the shovels, dirt rains, and hundreds of men at work. From this great height they look like tiny specks.

Through several yellow fever epidemics and constant tropical diseases and the intense scorching sun, the men on the job have labored steadily day after day to accomplish this wonderful work, until now it is practically finished. This excavation is so immense that any ship crossing the Atlantic Ocean today could easily be buried in it.